

REMARKS

A. Rejections Under 35 U.S.C. § 103(a)

In the final Office Action of April 29, 2005, Claims 13 to 25 are rejected as being unpatentable over U.S. Patent No. 6,630,008 ("Meeks") in view of U.S. Patent No. 4,961,778 ("Pyzik"). These rejections are respectfully traversed.

Claim 13 is amended to recite that aluminum is consolidated using two compression steps at increasing temperatures, both temperatures being well below the melting temperature for aluminum (~1220 °F). Neither Meeks nor Pyzik teaches or suggests a two-step consolidation method at such temperatures.

Meeks teaches the use of a granular pressure transmitting medium to consolidate a heated powdered preform. Nanophase materials are readily compressible due to their small size, particularly at high temperatures. In view of the small particle sizes, Meeks teaches that heated nanophase metals are "virtually instantaneously" densified a shaped metal preform to a "fully dense" state (see col. 4, lines 50 to 59). Clearly, a person of ordinary skill in the art would not find motivation in Meeks alone to perform a method that incorporates a second compression step since nanophase metals are readily and instantaneously compressible to a fully dense state.

Pyzik teaches a method that may include compressing an article at two temperatures (col. 5, lines 21 to 48). However, Pyzik teaches that compression of entirely solid metal particles only takes place during the first compression step, and that the second compression step melts some compressed metals and forces molten metal into interstices that exist between the particles. Col. 7, lines 23 to 36 states,

"it is a key element of the present invention to replace or supplement the internal capillary forces of a given, particularly non-wetting, system with a ... pressure-temperature regime that first, creates a substantial liquid metal phase

and, secondly, pushes the liquid metal into ceramic grain interstices to achieve fully dense products."

Thus, Pyzik fails to teach or suggest that aluminum is consolidated using two compression steps at increasing temperatures, both temperatures being well below the melting temperature for aluminum. For at least this reason, the rejection of claims 13 to 25 should be withdrawn.

Also, the combination of Meeks and Pyzik is one that a person of ordinary skill in the art would not consider or use to arrive at the present invention; this is because Pyzik is directed to compressing and forming articles from base materials that are of a completely different scale than those of Meeks, and also those of the present invention. Further, as discussed above, Meeks is directed to compression of a solid, while Pyzik is directed to compression of a heated liquid metal into the interstices of a ceramic structure.

Meeks teaches the use of a granular pressure transmitting medium to consolidate a heated powdered preform. Nanophase materials are readily compressible due to their small size, particularly at high temperatures. In view of the small particle sizes, Meeks teaches that heated nanophase metals are "virtually instantaneously" densified a shaped metal preform to a "fully dense" state.

Pyzik is directed to particles of a larger scale than those of Meeks, and those of the present invention. All of the metal particles compressed using the Pyzik methods are sized on the micrometer scale (see col. 14, lines 54 to 57; col. 18, lines 3 to 5). Micrometer-scale particles are up to three orders of magnitude larger than nanometer-scale particles, and consequently compress less readily than nanometer-scale particles. For at least this reason, a person of ordinary skill in the art would not find Pyzik as directed to sufficiently analogous technology when attempting to improve or modify the Meeks patent. Because Pyzik would not be considered together with Meeks, a person of ordinary skill in the art would not perform a double compression on nanophase materials at increasingly higher temperatures, and thereby reach the present invention, based on the existence of both patents. "The mere fact that references can be combined or modified does not render the resultant combination obvious

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unless the prior art also suggests the desirability of the combination. In re Mills, 916 F.2d 680, 16 USPQ2d 1420 (Fed. Cir. 1990)." M.P.E.P. § 2143.01.

Further, as mentioned previously, Pyzik teaches that compression of metal particles only takes place during the first compression step, and that the second compression step melts some compressed metals and forces molten metal into interstices that exist between the particles. This process is so different from the Meeks compression procedure, which does not involve melting the nanophase materials and infiltrating grain interstices, that a person of ordinary skill in the art attempting to carry out or perfect the Meeks procedure would find Pyzik to pertain to such an incompatible process that Pykes would be considered impertinent. The principles of operation for the Meeks and Pykes compression processes differ on a fundamental level. For this additional reason, the combination of Meeks and Pykes does not render the present invention obvious. "If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious. In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)." M.P.E.P. § 2143.02. For the foregoing reasons, it is respectfully requested that the rejections of claims 13 to 25 be withdrawn.

B. Conclusion

In view of Applicant's amendments and remarks, it is respectfully submitted that Examiner's objections and rejections have been overcome. Accordingly, Applicants respectfully submit that the application is now in condition for allowance, and such allowance is therefore earnestly requested. Should the Examiner have any questions or wish to further discuss this application, Applicants request that the Examiner contact the Applicants attorneys at the below-listed telephone number.

If for some reason Applicants have not requested a sufficient extension and/or have not paid a sufficient fee for this response and/or for the extension necessary to prevent abandonment on this application, please consider this as a request for an extension for the required time

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period and/or authorization to charge Deposit Account No. 50-2091 for any fee which may be due.

Respectfully submitted,

INGRASSIA FISHER & LORENZ

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By: 

David K. Benson

Reg. No. 42,314

(480) 385-5060